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**** WARNING ****

PROTECT YOUR MUPETS

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IT HAS BEEN REPORTED THAT MUPETS HAVE FOUND A WAY TO KILL OTHER MUPETS. THIS TAKES PLACE IF ALL THE COMPONENTS OF THE MUPET SYSTEM ARE NOT ON THE SAME CIRCUIT.(IE. ELECTRICAL WARS)

THIS IS DUE TO THE FACT THAT DIFFERENT CIRCUITS COMMONLY HAVE DIFFERENT GROUND VOLTAGES AND THIS DIFFERENCE IS CARRIED THROUGH ANY INTERCONNECTED ELECTRICAL EQUIPMENT 'ZAPPING' COMPONENTS ALONG THE WAY.(THIS IS EXPEN$IVE TO FIX)

THEREFORE BEFORE INSTALLING ANY MULTI USER SYSTEM EITHER MAKE SURE IT IS ALL ON ONE CIRCUIT OR IF IT MUST BE ON MORE THAN ONE CIRCUIT HAVE AN ELECTRICIAN CHECK THE CIRCUIT GROUND VOLTAGES FOR SIMILAR GROUND VOLTAGES.

(THIS IS TRUE FOR ALL ELECTRIC SYSTEMS, STEREO'S,COMPUTERS ETC. NOT JUST MUPETS)

MEETING YOUR MUPET

The MUPET is a software transparent IEEE multiplexer designed specifically to link several Commodore PET/CBM microcomputers to common Commodore IEEE peripherals (disk drives, printers or modems). The system is designed for operational simplicity in that the system installation time is typically two minutes. It requires no special commands and functions automatically with most software packages.

A typical MUPET system involves a single 'control module' that the IEEE peripherals are daisy-chained to using standard Commodore IEEE cables. Up to eight PET/CBM computers can be fitted with 'MUPET' modules through their IEEE port. These computers are then daisy-chained from the controller with six foot cables. Once connected one has only to turn the power on and use the system as if there were only one computer linked to the disk drive, printer, etc.

Since computer-to-disk transmissions occur at 3000 characters per second and computer-to-printer transmissions run typically at 30-300 cps, we have developed a 'DOUBLE MUPET module' which provides a local IEEE channel to a computer so that it may print locally without tying up the shared MUPET disk bus. We have available printer spooler software and disk 'Wedge' software to aid the user in these multiplexed systems.

In its first year, approximately 3500 computers have been MUPETted together on five continents, and they have found their way into a variety of educational, business, word-processing and automatic testing applications. Some commercial software packages including MICROMATH, WORD-PRO PLUS and WORDCRAFT 80 have been written to be fully compatible with the MUPET system.

Since the MUPET system is software transparent, it places very few constraints on any hardware operating system that uses it. The following Commodore products may be joined by a MUPET system in virtually any combination.

Computers	Disk Drives	Printers
Small Keyboard (2.0)	2040 1.0 DOS	2022
2001-8k	2040 2.0 DOS	2023
2001-16k	4040 2.0 DOS	4022
2001-32k	8050 2.5 DOS	4023
4016	8250 2.7 DOS	4024
4032	2031 2.0 DOS	
8032		
Superpet		
VIC-20 IEEE		

YOUR MUPET'S ANATOMY

The MUPET system has six different types of components that are necessary to insure its operation. Their purpose and configuration will be mentioned below.

The Power Supply

A single plug-in wall transformer is provided which supplies 12 VDC to the MUPET controller. The raw voltage is smoothed and regulated in the controller which then supplies power to all of the MUPET modules. For installations outside of North America, the user must supply their own transformers or, as some of our foreign users have done, substitute a 9 V battery for the transformer.

The Controller

One Controller is required for any MUPET installation, irregardless of the number of computers linked to the system. Other than providing power for the system, it serves as a node between the computers and the shared IEEE devices. It therefore has two connectors on it. One connector links the controller via standard Commodore PET-IEEE and IEEE-IEEE cables to disk drive and/or printer and/or other IEEE devices that are to be shared by the computers. The other port is for a special 20 wire ribbon cable to daisy-chain the 2-8 computers together.

The controller uses solid state logic to poll each of the computers on the bus to determine which computer wants one of the shared devices and to give that computer sole access to the MUPET bus. The controller will hold the bus for one second after it completes a IEEE operation (for programmed file handling/printing) after which time it will then continue to poll the computers to find the next unit that is requesting the bus.

Since the controller is 'listening' to one computer at a time it is impossible for two computers to simultaneously access the bus or for one computer to interfere with another's IEEE operations.

The MUPET Module

The standard MUPET module plugs directly into the IEEE port on the back of a PET/CBM computer and again uses solid state logic to provide the link between each computer and the controller. One module is connected to the Controller and all other modules are simply daisy-chained to the next module to create a long string with the controller and IEEE devices at one end and a PET/CBM some distance away at the other.

It is the module that will either link the computer to the controller or place the computer in a IEEE wait state until its turn comes to access the bus.

As an aside, there is no reason why other computers that have IEEE (GPIB or HPIB) communications ports cannot also access the shared devices through the MUPET module. The alien computer would need an imitation Commodore IEEE edge connector and some software to emulate the Commodore IEEE command structure.

The DOUBLE MUPET Module

If one computer is going to spend a long time accessing an IEEE device that is on the shared bus, the MUPET will not let any other device access the common bus while this unit is busy. In the case of modems, IEEE test equipment and in heavy printing environments, the waits caused by units using these shared devices may be too lengthly for some applications. The DOUBLE MUPET module can eliminate these problems if only one computer need access these slow or busy IEEE devices.

The DOUBLE MUPET module gives the computer to which it is linked selective access to either the shared MUPET bus or its own local IEEE bus. The selection is performed either by a hardware switch or through software control via the USER port. This single computer may then load programs or word-processing files from the disk at 3000 cps on the shared bus, and then print them off-line on it's local IEEE bus. If IEEE test equipment is being used, the computer may load test software from the MUPET, then switch and perform data collection on it's local IEEE, and then switch back to the MUPET to store the test results on the disk drive.

The Cables

Each MUPET or DOUBLE-MUPET module is shipped with a six foot cable to link the modules and controller together. We offer additional twelve and eighteen foot cables if longer inter-device distances are required, and we can provide longer custom cables for specific applications.

The IEEE specification quotes that the maximum inter-device distance on the IEEE bus is six-meters and that the maximum distance between any two devices on the IEEE bus is twenty-meters. The MUPET system is guaranteed to meet the IEEE specification for inter-device distances, though some users have extended the system to include 125ft inter-device runs with 131ft maximum runs.

The Terminator

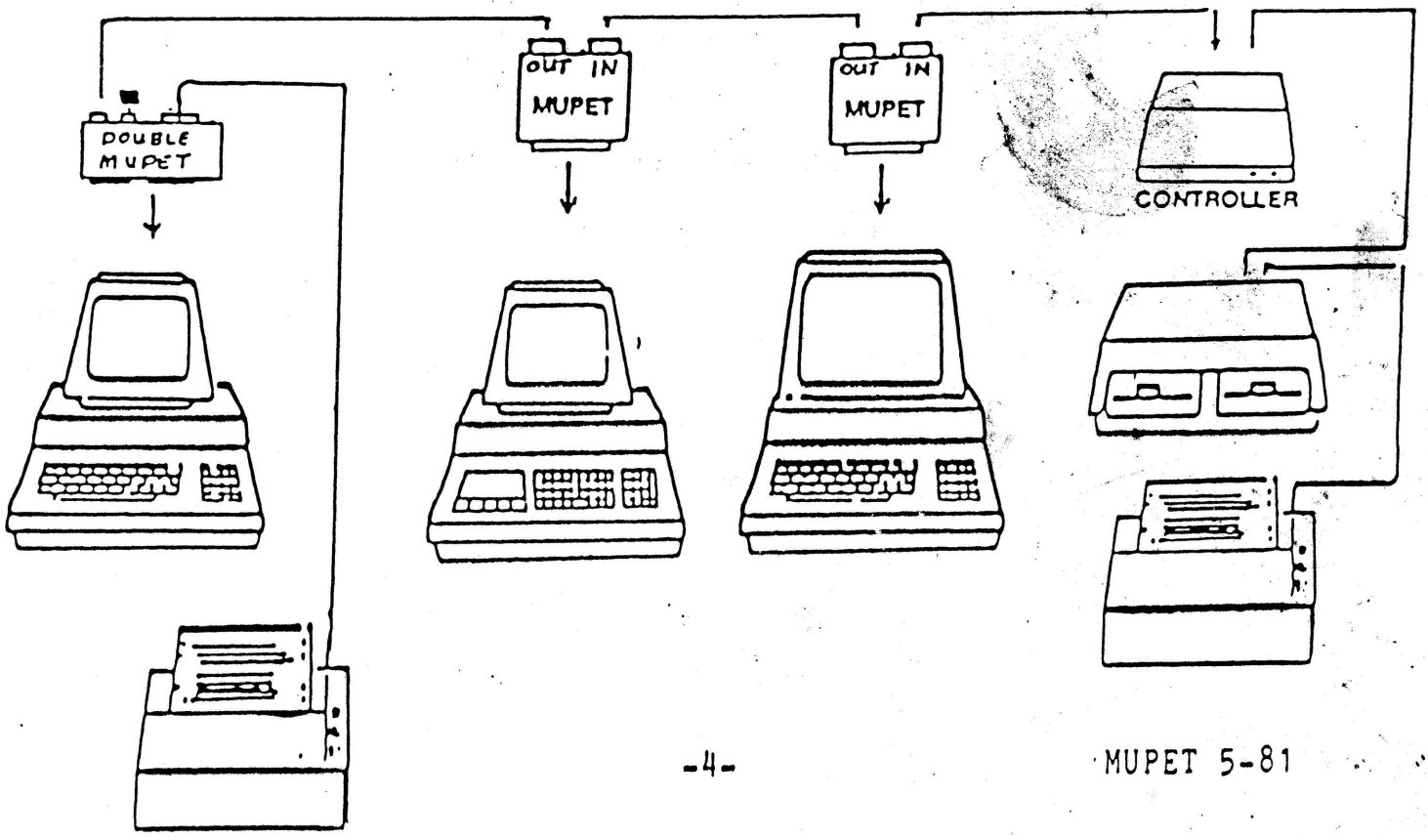
One terminator is included with the MUPET, and it should be placed on the 'out' port of the last MUPET module in the chain. It is used to close the loop in the controllers polling sequence and permits the use of a variable number of modules while maintaining a fast system response. The terminator is not necessary for the systems operation since the controller will execute a forced reset of the polling sequence after a fixed time delay (ca 3 seconds).

Although MUPET's do prefer wide open spaces with no smokers, they will operate in any environment that the Commodore computers find palatable. Since the MUPET is supplied with six-foot cables (with longer cables optional), the prime constraints used in setting up a multiplexed system are human, and not a function of the hardware. The installer should consider first how convenient an access each user should have to the disk drive. In some applications (primary school, heavy industry) the disk unit should be remote from the actual computers, while others (business, university) often require a routine exchange of the diskettes and immediate access to the drive.

Another item to consider is the physical placement of the printer relative to the computers. Although immediate access to review printouts and/or exchange paper is convenient, it is often more desirable to place the NOISY printer at a relatively distant location.

The only physical constraint that the MUPET places on a computer installation is that each MUPET module does require about four inches of space between the computer and any obstacle behind the computer. If it is necessary to have the computer very close to a wall, special PET/CBM edge connector extension cables are available (but expensive) which will allow you to place the MUPET module beside or under the computer. The DOUBLE-MUPET, since it also uses the USER port will require two of these cables.

The figure below illustrates one of the configurations that are currently in use.



The system should be installed with all units OFF to prevent any accidental electrical damage to the installer or installee. After physically positioning all the computer, disk and printer units in the desired configuration, the following MUPET installation should be followed.

1. Place the controller box on top of the Commodore disk drive. By positioning it here you will not be able to place anything else on the drive (thus no overheating and associated read/write errors) and the controller is in a convenient position to be connected to the disk drive.

2. Using a Commodore PET-IEEE cable, connect the edge connector of the Controller to the IEEE connector on the disk drive. Now connect any other peripherals (printer) to the disk drive using Commodore IEEE-IEEE cables (fig 5).

3. Plug a MUPET module into the IEEE port (the slot nearest the power switch) on the back of the computer that is closest to the Controller (fig 6).

4. Using the MUPET ribbon cable, connect the edge connector on the Controller to the 'IN' port on the MUPET module. Note that the cable and connectors are keyed and will only fit together one way.

5. Now continue to plug modules into the IEEE port of the computers and link the modules together 'OUT' to 'IN' with the MUPET cables until you run out of computers or MUPETs.

6. The terminator should now be placed on the 'OUT' port of the last module to complete the installation.

7. Now power up all the computers, peripherals and Controller. The Controller's red LED should flash for a moment and then the green LED should flicker continously. If this is not the case, refer to the troubleshooting section of this manual.

8. If a DOUBLE-MUPET is in the system, make sure that the switch is in the 'ON' position to enable the MUPET bus or software select option. If this switch is 'OFF' the computer will have access to the local IEEE bus only (fig 7).

9. Now place a diskette in the disk drive, initialize it if necessary, and forget about the MUPET.

10. If any IEEE device (disk, printer, modem, other) behaves oddly, be sure that all peripherals on the MUPET or DOUBLE-MUPET have unique IEEE device addresses, since two devices sharing the same address will both respond to any commands sent to that address.

KEEPING EVERYONE HAPPY

It is a curious thing about computers and all their buddies, they always do exactly as they are told and do the same thing every time. If they don't, then they are sick. When Commodore designed the PET/CBM line of computers and peripheral devices, they took the unique route of distributing the intelligence and computing responsibility throughout the system. For example, all computers (except the Superpet) have one microprocessor, but all five inch disk drives were designed with two microprocessors to perform intelligent functions.

The disk drive was given enough intelligence to handle one human/computer interraction at a time, and it is possible to confuse it when more than one human is accessing it at one time. As it turns out, program load and save commands simply open a file, perform the function and then close it when done. This activity will never cause a hardware problem on the MUPET. However, one person may save his program over another program if the same name has been used.

Disk data file handling can open a whole new bag of worms to the casual user. Some programmers hints are listed below.

1. Whenever performing a disk access, always read the error channel after performing the operation.

   The MUPET system watches the IEEE control lines to determine whether or not to hold on one computer, or to continue to poll through the system in search of an IEEE request. If one computer accesses the disk drive and creates any disk error, the disk drive itself holds one of the control lines and keeps the disk and one computer linked until the error channel is cleared. Therefore, if a computer generates a disk error the computer that generated the error must clear the error by reading the channel, initializing the drive, reading a directory or by powering off and on.

   Any file handling software should be written to read the error channel during operation to clear file full, file not found, and other possible disk errors.

   We have available a version of the 'WEDGE' that reads the error channel after loads, saves, etc. as well as 'MUP AID' (by The Information Connection), which controls directory access and loads, and we will provide this software to users on request for the price of the media.

2. When reading data files, always open the file, read the data, and then close the file in one operation so that the bus will not be released with an open data file on the disk.

The Commodore disk drives can have a limited number of files open at any one time. The 2040, 4040 and 8050 units have 10 buffer regions available for data handling. Each sequential file uses two of these buffers, while a direct (relative) access file uses three. It therefore permits a maximum of five sequential or three direct access to be open at the same time. If, for example, four computers try to open a direct access file, the first three will be successful and the fourth unit will generate a disk error.

If two computers open the same data file on disk, and read records without closing the file, it is very possible to confuse the disk drive to distraction. It simply happens that the disk maintains pointers within its memory referring to the position of the last record accessed, and multiple accesses to the same file can change the pointers so that they no longer refer to the proper location. It is also possible for one computer to close the file which will generate a error when the other tries to access the file.

If one computer has opened and leaves an open data file on disk and a second computer then loads/saves a program or gets a directory, some operating systems will close all disk files after that operation. The first computer will then generate a disk error if he tries to access his previously 'opened' data file.

With all this confusing activity, perhaps it is understandable why the programmer should take special precautions when handling data in multi-user environments.

3. When using to a shared printer, always print a page at a time rather than a line at a time. Otherwise it is possible for several computers printouts to 'merge' together on the printer in a generally useless form. A string array is usually used to store the data in the computer until a page is generated or the data is complete. Paging and top-of-form instructions should be sent to the printer to insure pagination.

4. At times it may be desirable for one computer to hold the MUPET bus, and this can be performed under software control with a single 'poke'. POKE 59456,189 will lock the MUPET to one computer. Any IEEE activity generated by this unit will then clear this poke and it must be repeated after each operation to keep the MUPET locked to this computer.

The DOUBLE MUPET module is offered as an option the MUPET disk multiplexing system. It allows the PET/CBM computer to which it is attached selective access to either the MUPET bus or to its own local IEEE bus.

This feature allows the user to configure a system in which the computer can be selectively linked to either the Commodore disk drive or to its own local IEEE unit, such as a printer or a GPIB device, which it may use without disturbing any MUPET operations.

The DOUBLE MUPET can be switched from disk to local busses by either hardware or software action. In hardware the user may simply use the switched on the back of the unit to select 'on' (MUPET/disk drive) or 'off' (local IEEE). In software the DOUBLE MUPET reads a signal generated on the USER PORT of the PET/CBM to determine which bus is active. This short program illustrates software selection of channels.

First enter this program, and then, in direct mode type:

```
OPEN8,8,8,"LIST,S,W": CMD8: LIST
PRINT#8,"END": CLOSE8
```

to create a sequential file on disk. Now type RUN.

```
 10 POKE 59459,255          :REM  set USER PORT for output
 20 POKE 59471,255          :REM  select MUPET/disk bus
 30 OPEN 1,8,15,"I"         :REM  initialize disk and
 40 CLOSE 1
 50 DIM A$(100)
 60 OPEN 8,8,8,"LIST,S,R" :REM  open for read
 70 I=I+1
 80 INPUT#8,A$(I)           :REM  input a string
 90 IFA$(I)="END"THEN110    :REM  check for end
 100 GOTO 70
 110 CLOSE 8
 120 POKE 59471,0           :REM  select local IEEE bus
 130 OPEN 4,4               :REM  open printer
 140 FOR J=1 TO I
 150 PRINT#4,A$(J)          :REM  list program
 160 NEXT
 170 CLOSE 4
```

CHECKING SICK MUPETS

Since each MUPET is tested before shipment and fewer than one in one-thousand systems have failed, it is most likely that a mis-behaving system is connected incorrectly or one of the devices attached to it does not match the Commodore/IEEE specifications.

(A) Neither LED lights when the MUPET is turned on
- (a) check transformer and AC for power
  - (b) power ok
    - (c) place terminator on controller/remove IEEE cable
      - (d) green LED on-controller OK
      - (dd) no light-sick controller
  - (bb) power bad
    - (c) turn on power
    - (cc) replace transformer unit

(AA) Green LED flashes 5-30hz, red LED off
- (a) MUPET is polling the system properly

(AAA) Red LED on continously, no green LED
- (a) occurs on power-on
  - (b) disk drive/printer bad
    - (c) turn off/on devices
    - (cc) isolate bad unit and repair
  - (bb) computer bad
    - (c) reset computers
    - (cc) power up all computers
    - (ccc) isolate bad unit and repair
  - (bbb) MUPET bad, remove IEEE devices
    - (c) test modules w/terminator individually
      - (d) replace defective cable
      - (dd) replace defective module
- (aa) occurs while system in use
  - (b) computer
    - (c) normal disk/printer access
    - (cc) computer crashed during IEEE activity
  - (bb) disk error
    - (c) clear error channel
    - (cc) reset disk drive
  - (bbb) printer error
    - (c) check for paper out
    - (cc) check for jamming
  - (bbbb) all above OK
    - (c) reset entire system

(AAAA) Slowly flashing green LED (1/3sec.)
- (a) terminator not in place
- (aa) circuit not complete
  - (b) cable not connected
  - (bb) open circuit
    - (c) test modules w/terminator individually
      - (d) replace defective cable
      - (dd) replace defective module

SPECIFICATIONS

The Power Supply

Plug in wall transformer
supply 12 VDC at 400 mA
mini phono plug for controller

Data Transmission

speed meets Commodore spec. (ca. 30,000 baud)
maximum inter-device distance of six meters
maximum distance between two devices of twenty meters

Configuration

eight computer maximum on MUPET bus and..
three peripherals on the shared bus

Comments

Each MUPET system has been tested as part of a ten MUPET system that share a 2040 disk drive and 2022 printer. It may be possible to exceed the above specifications if the perfect combination of MUPETs, computers, peripherals and astrological signs is found. For example, some users are successfully operating twelve MUPETs on a single bus while others have installed systems with the MUPET bus extending over forty meters. Although these installations work well, we cannot guarantee that any specific system will meet these conditions.

WARRANTY

Canadian Micro Distributors Ltd., (CMD) warrants MUPET systems sold by it to be free from defects in material and workmanship and to meet applicable specifications under normal use and service for a period of 6 (six) months from the date of original shipment by CMD. CMD's obligation under this warranty is limited to the repair or replacement without charge of MUPET products that, in CMD's opinion, were defective originally or became defective under normal usage rather than by misuse, negligence or accident.

Each returned product must include a detailed report describing the defect and/or failure, and a minimum test and handling charge of $25.00 will be applied to any returned product that is found to be in good working order.

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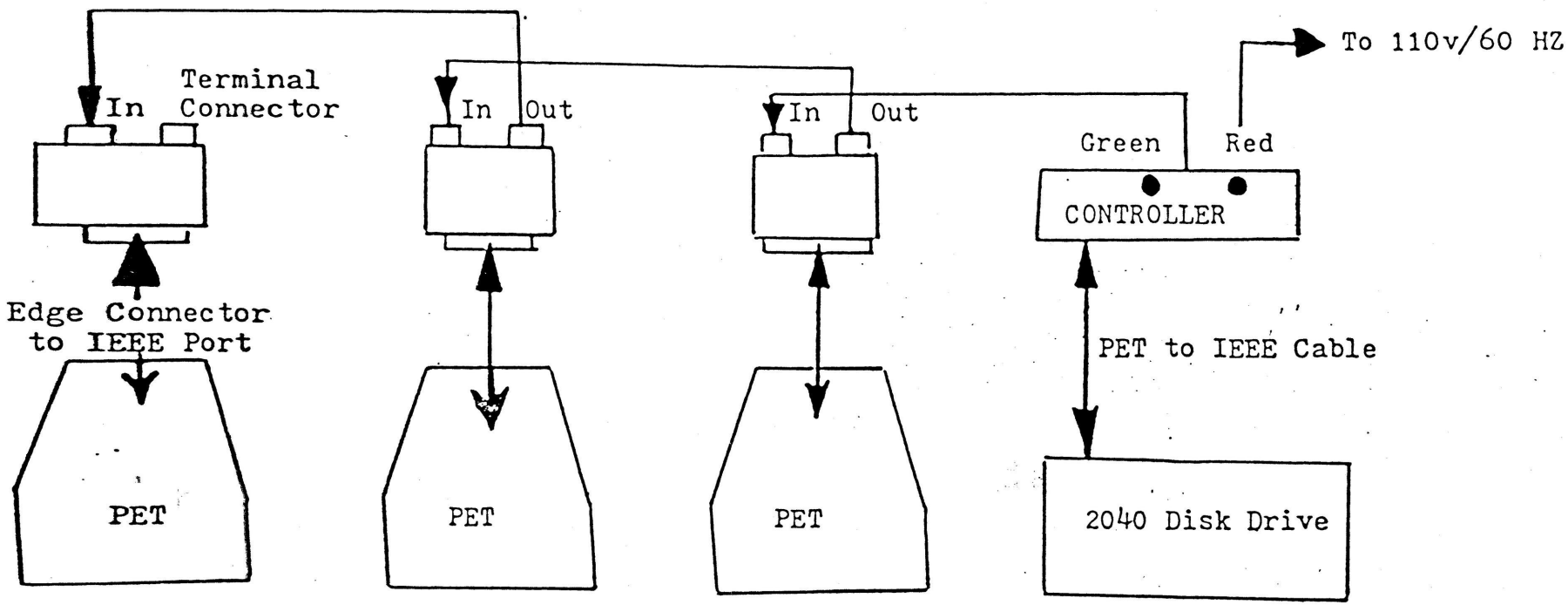
PET/MUPET 3CHANNEL CONNECTION DIAGRAM



NOTE:

1) All connectors are keyed.

2) Flashing green light denotes system on line and the BUS is free.

3) Solid red light denotes Bus occupied.

4) The system must be powered off before connecting MUPET modules.

5) All PETs must be powered on.